

2.1 Biodiversity and Evolution – Questions

1. (a) Complete the following table, which shows the classification of some organisms, including **two** features only of the phylum where applicable. [9]

<i>Kingdom</i>	<i>Phylum</i>	<i>Features of phylum</i>	<i>Class</i>	<i>Example</i>
Animalia	Annelida	1. 2.	Polychaeta	Lugworm <i>Arenicola marina</i>
Animalia		Soft moist skin; External fertilisation; Aquatic larvae with gills; Adults simple lungs.		Common frog <i>Rana temporaria</i>
Animalia		1. 2.		Desert locust <i>Schistocerca gregaria</i>
	Basidiomycota	Hyphae; Cell wall of chitin; Reproduce using spores; No flagella;	Basidiomycetes	Field mushroom <i>Agaricus campestris</i>

- (b) What is the name of the genus of the Desert locust? [1]

.....

(Total 10 marks)

2.

1. The table below lists five organisms, together with the five kingdoms. Tick (✓) a box to place each organism in the kingdom to which it belongs. [5]

	<i>Plantae</i>	<i>Animalia</i>	<i>Protocista</i>	<i>Fungi</i>	<i>Prokaryotae</i>
Jellyfish					
Yeast					
Amoeba					
Moss					
Bacterium					

(Total 5 marks)

3.

2. (a) Which one of the following features, found in two different animals, indicates a common ancestor? [1]
(Tick (✓) your choice.)

Fins of sharks and dolphins. ☐

Wings of birds and bats. ☐

- (b) (i) The Galapagos finches illustrate the evolution of different birds from one ancestral form. What name is given to this evolutionary spread of new forms? [1]

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- (ii) If a foreign finch was introduced into Britain now, it would be extremely unlikely for it to give rise to a similar variety of descendants to those on the Galapagos. What was different about the situation when the first finches arrived on those islands? [2]

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- (c) Why are the Galapagos finches now recognised as separate species, rather than simply varieties of the same species? [1]

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- (d) State the best technique for working out the relationships between the descendants of the original finch. [1]
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(Total 6 marks)

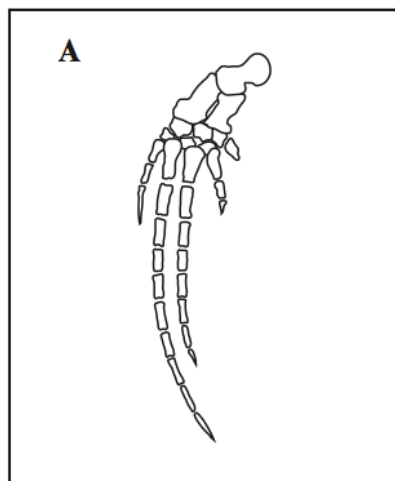
4.

4. (a) To which phylum do mammals belong?

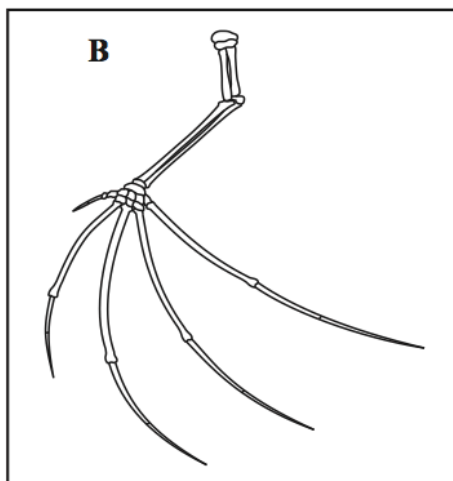
[1]

(b) The drawings below show the bones in the limbs of three different mammals.

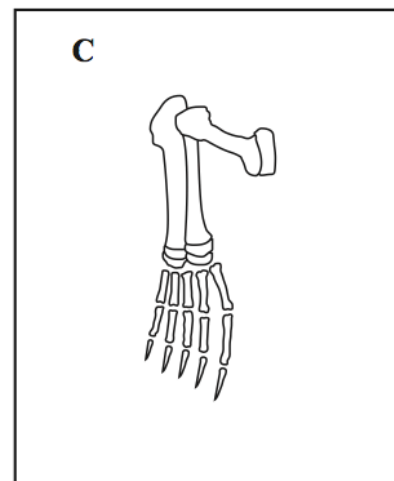
[not to scale]



Balaenoptera acutorostrata



Macroderma gigas



Phoca vitulina

(i) What name is given to limbs with the pattern of bones shown in the drawings? [1]

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(ii) Suggest which of limbs A, B or C is best adapted for flight. [1]

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(iii) Give the genus of the mammal with limb C. [1]

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(c) (i) The limbs of these mammals are similar in structure but serve quite different functions. What term is used to describe such structures? [1]

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(ii) How are such structures used as evidence for evolution? [1]

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- (d) The sequence of amino acids in the haemoglobin molecules of the three species has been used to determine their evolutionary relationships. The results below show the same sections of the haemoglobin molecules of the three mammals, each letter represents one amino acid.

<i>M. gigas</i>G E E K A A V T G L W G K V N V E....	D S....	S
<i>P. vitulina</i>G E E K S A V T A L W G K V N V D....	D S....	S
<i>B. acutorostrata</i>A E E K S A V T A L W A K V N V E....	E A....	T

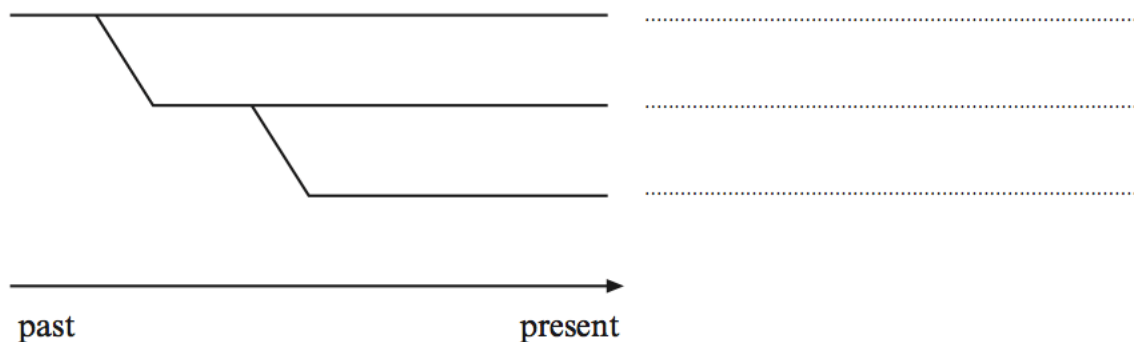
- (i) There are 7 differences between *B. acutorostrata* and *M. gigas*.
 There are 3 differences between *P. vitulina* and *M. gigas*.
 How many differences are there between *P. vitulina* and *B. acutorostrata*? [1]

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- (ii) Which species is more closely related to *Phoca vitulina*? [1]

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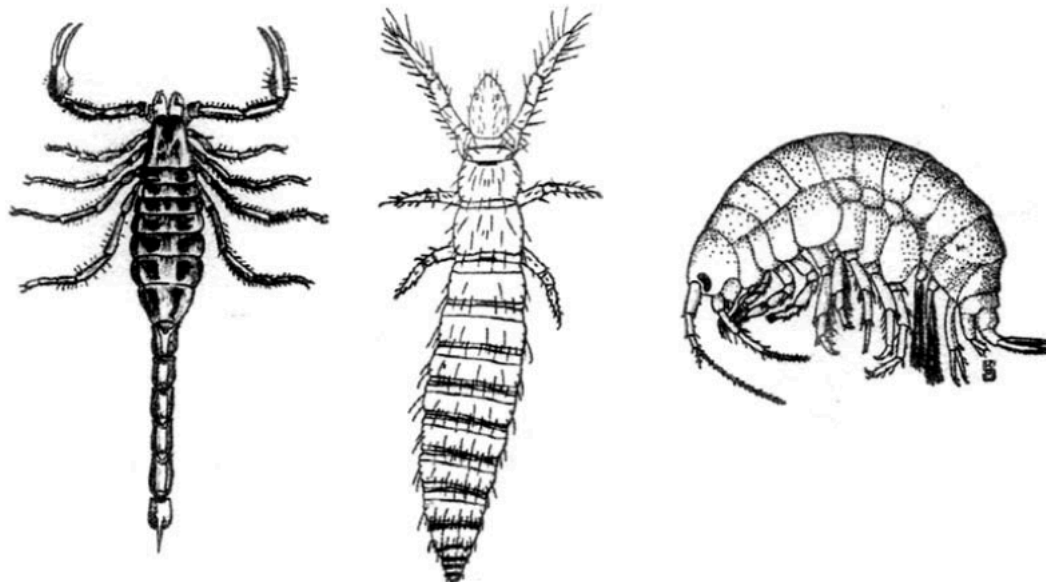
- (e) Use your answers to part (d) to complete the following (phylogenetic) evolutionary tree. [1]



(Total 9 marks)

5.

The animals in the diagram below belong to the phylum Arthropoda.



- (a) Apart from having an exoskeleton, name **two** other features **that you can see in the diagram** that members of the Arthropoda have in common. [2]

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- (b) Give **one** advantage and **one** disadvantage of an exoskeleton. [2]

Advantage

.....

Disadvantage

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- (c) Each of the animals above belongs to one of the four main sub-groups of the Arthropoda. Name the taxonomic level of these sub-groups. [1]

.....

(Total 5 marks)

6.

Twenty thousand years ago, cheetahs (*Acinonyx jubatus*) roamed throughout the savannahs and plains of four continents: Africa, Asia, Europe, and North America.



About 10 000 years ago - because of climate changes - all but one species of the cheetah became extinct. With the drastic reduction in their numbers, close relatives were forced to breed and the cheetah became genetically inbred, meaning that all cheetahs are closely related.

(a) Classify the cheetah. [3]

Phylum

Class

Genus

(b) Name **one** feature that a cheetah has which allows the correct identification of each of its phylum and class. [2]

Feature of the phylum

.....

Feature of the class

.....

(c) The drastic reduction in the numbers of cheetah results in the loss of genetic diversity in the population. What term is applied to this? [1]

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- (d) (i) What biochemical method could have been used to determine that all cheetahs are closely related? [1]

.....

- (ii) What would the results show? [1]

.....

.....

(Total 8 marks)

7.

The photographs show two species of swallowtail butterfly.



Two-tailed Swallowtail
(*Papilio multicaudata*)



Blue Mountain Swallowtail
(*Papilio ulysses*)

(a) Butterflies belong to the same phylum as lobsters and spiders.

(i) Name the phylum to which these organisms belong. [1]

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(ii) Describe **two** features that all members of this phylum have in common. [2]

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(b) Based on their physical characteristics the species of butterfly shown above are believed to be closely related. However, the Two-tailed Swallowtail is found in the USA while the Blue Mountain Swallowtail is found in Indonesia. It is possible that these species of butterfly may have become similar in form due to **convergent evolution**.

(i) State what is meant by the term *species*. [1]

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.....

(ii) Name the taxonomic **level** which suggests that the butterflies are closely related. [1]

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- (iii) Identify **one** method that could be used to confirm whether these butterflies are closely related or are the result of convergent evolution. [1]

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- (iv) Describe how this method would show whether the butterflies are closely related. [1]

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.....

(Total 7 marks)

8.

The species is the basic unit by which biodiversity is measured.

(a) Define the term *species*.

[2]

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(b) Some data on biodiversity is shown below.

	Estimated number of species		
	Britain	Borneo	World
Latitude (how far North of equator)	53°N	1° N	
Fish (freshwater)	38	394	>8500
Amphibians	6	100	>4000
Reptiles	6	105	6500
Birds (breeding residents)	210	600	9881
Mammals	48	288	4327

(i) Which vertebrate class in the table above shows the greatest biodiversity?

[1]

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(ii) Using the table above, the percentage of the world's species of reptiles found in Britain was calculated as 0.09%. Calculate the percentage of the world's species of reptiles found in Borneo.

[1]

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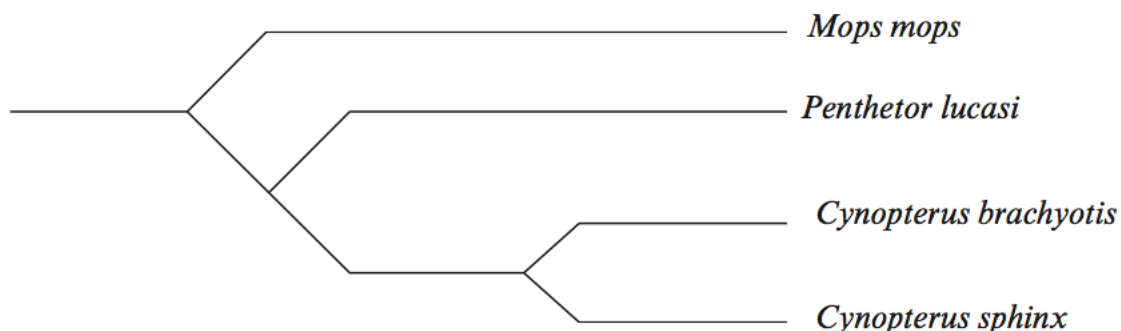
(iii) Describe how the data above confirms the general pattern of biodiversity across the globe, from poles to equator.

[1]

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- (c) There are 288 species of mammals in Borneo, of which 102 belong to the order Chiroptera (bats). The following diagram is a phylogenetic tree showing the evolutionary relationship between some of the bats.



- (i) Suggest, by marking an **X** on the phylogenetic tree above, the position of an ancestor common to *Pentheter lucasi* and *Cynopterus sphinx* but not common to *Mops mops*. [1]
- (ii) What do the latin names of *Cynopterus brachyotis* and *Cynopterus sphinx* tell us about their classification? [1]

.....

.....

- (d) The wings of bats show similar morphology to the flippers of seals but have completely different morphology to the wings of insects. State the terms applied to structures that show

- (i) common structure but different functions; [1]

.....

- (ii) common functions but different structures. [1]

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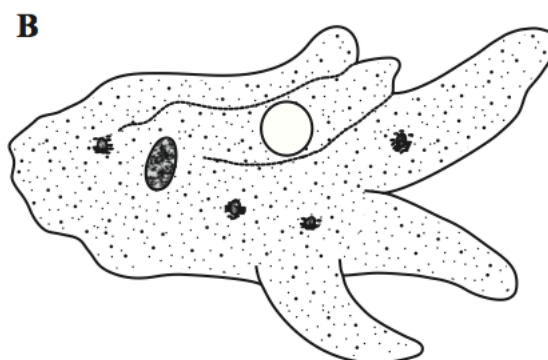
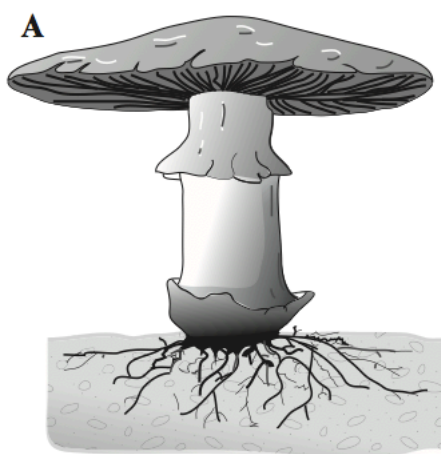
9.

1. (a) Complete the table on classification given below.

[4]

Kingdom	Phylum	Class	Genus
	Angiosperm	Dicotyledons	Ranunculus (Buttercup)
Animalia		Oligochaetae	Lumbricus (Earthworm)
Animalia		Mammalia	Rattus (Rat)
Animalia	Arthropoda		Locusta (Locust)

- (b) The diagrams, **A** and **B** below, show two organisms from **two** other Kingdoms *not* given in the table.



- (i) Name the **two** Kingdoms to which the two organisms belong.

[2]

A

B

- (ii) State **one** characteristic of each organism which is a feature of its Kingdom.

[2]

A

B

10.

1. The table below shows certain characteristics of four kingdoms. If the characteristic is present in members of the kingdom this is shown with a tick (✓). If the characteristic is not present this is shown with a cross (X).

Complete the table below by giving the name of each kingdom.

[4]

		Kingdom			
Characteristic	Eukaryotic	✓	✓	X	✓
	Chloroplast	✓	X	X	some species
	Cell wall	✓	X	✓	some species
	Nucleus	✓	✓	X	✓

only

Essays

1.
 - (a) Describe the theory of evolution, as put forward by Charles Darwin, suggesting any evidence which supports his views. [10]
2.
 - (b) Describe the five Kingdoms into which all organisms are placed, giving the main features of each Kingdom. [10]